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Prep.by MACHAK

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Alternate #

SUBJECT

GUIDELINE CAVITY ENEVELOPE FOR AFT CONFIGURATION

PROJECT : SOFIA

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GUIDELINE CAVITY ENVELOPE FOR AFT CONFIGURATION

Dan Machak 5/11/92

GUIDELINE CAVITY ENVELOPE FOR AFT CONFIGURATION

This set of figures describes the envelope available to the telescope for an aft configuration. A single pressure bulkhead is centered at station 1730. Assuming a dumbbell configuration, the telescope is flipped 180° from the forward configuration so that the cavity is now aft of the mounting pressure bulkhead. The TA coordinate system axes (ref. SOF-1030) rotate with the telescope so that the TA x-axis points toward the nose of the aircraft and the TA y-axis points out the port wing when the TA is at 90° elevation angle and 0° LOS and cross-elevation angle. The aircraft coordinate system is not affected.

FIGURE 1: **AFT CAVITY - SIDE VIEW**
This figure shows a side view of the aft cavity. The station numbers for the forward and aft bulkheads are shown as well as the location of the reference TA origin.

FIGURE 2: **AFT CAVITY ENVELOPE: NON-OPERATING**
This figure shows the envelope available to the telescope in the aft cavity. Each dashed line corresponds to the space required by the cavity aperture door at a given aircraft station or range of stations. The area inside the dashed line for a given station is available to the telescope. The envelope contours in this figure correspond to movement of the cavity door through a full 360° around the door track. The envelope becomes more restrictive in the aft portion of the cavity due to the protrusion of the aft ramp shear layer control device. There must be at least one elevation angle at which the telescope can be caged (with 0° LOS and cross-elevation angle) such that the cavity door is allowed to move through the full range of motion shown in this figure.

FIGURE 3: **AFT CAVITY ENVELOPE: NON-OPERATING**
This figure depicts a 3-D representation of the envelope contours shown in FIGURE 2.

FIGURES 4-5: **INSTANTANEOUS ENVELOPE: OPERATING**
When the cavity aperture door is fixed at one particular elevation angle, the spatial envelope required by the door is less than shown in FIGURE 2. FIGURES 4 and 5 show how to use FIGURE 2 to construct the envelope that is in effect for a given elevation angle. As shown in FIGURE 4, the only contour line that is applicable *outside* the ±30° cone about the LOS axis defined by the heavy lines is the outer most dashed contour corresponding to stations 1740 to 1820. This contour line is used as the limitation for all stations between 1740 and 1920, except for that part of the lines which fall *within* the ±30° cone. In this area, the contour lines from FIGURE 2 are still in effect. FIGURE 5 shows the resulting envelope description when the door is set for a telescope elevation angle of 45°. The telescope must stay within this envelope under all operating linear and angular excursions.

FIGURES 6-7: **BULKHEAD AND CABIN ENVELOPES**
These two figures depict the spatial envelope available to the telescope on the pressure bulkhead and on the cabin side of the bulkhead. Note that in the numbering scheme of the aircraft station numbers, there is a break between station 1480 and station 1640. Since the portion of the 747 SP between these stations has been removed, these station numbers occur at the same location.

FIGURE 8: **BULKHEAD AND CABIN ENVELOPES**
This figure depicts a 3-D representation of the envelope contours shown in FIGURES 6 and 7.

FIGURE 9: **SHEAR LAYER ENVELOPE**
In addition to the constraints given in FIGURE 2, under operating conditions (ref. SOF-1030), no part of the telescope may come within 10" of the cavity shear layer. This envelope, with the 10" buffer already added in, is defined in FIGURE 9.
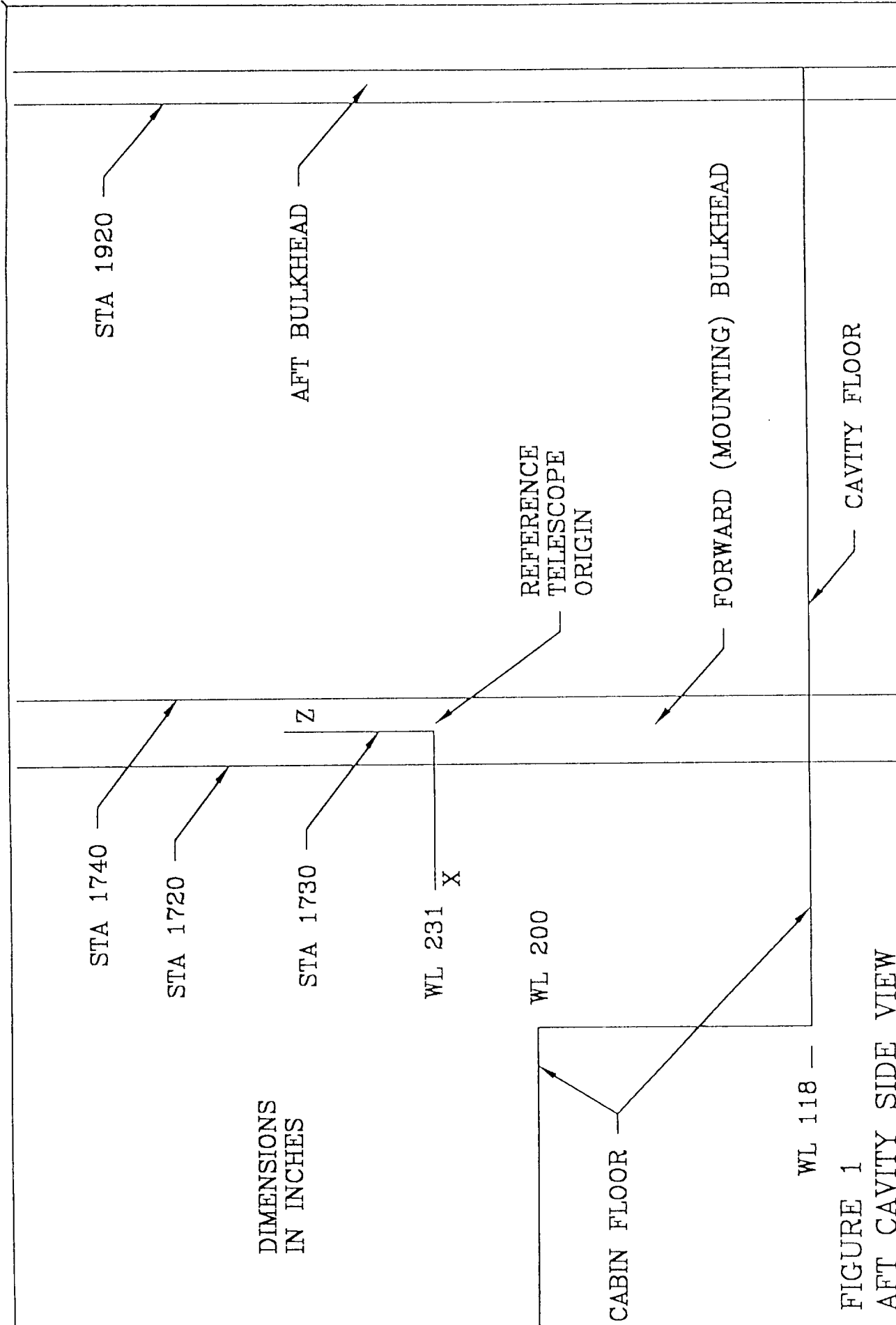
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STA 1920

AFT BULKHEAD

REFERENCE
TELESCOPE
ORIGIN

FORWARD (MOUNTING) BULKHEAD

CAVITY FLOOR

STA 1740

STA 1720

STA 1730

Z

WL 231 X

WL 200

DIMENSIONS
IN INCHES

WL 118 —

CABIN FLOOR

FIGURE 1
AFT CAVITY SIDE VIEW

D. MACHAK	AS DOOR ELEVATION RANGE:	NA
	TELESCOPE ELEVATION RANGE:	NA
5/7/92	MAX. OUT OF PLANE ANGLE:	NA

SCALE: .025"=1"

0   40   80

STA 1884
STA 1880
STA 1870
STA 1860
STA 1850
STA 1840
STA 1740 –1820
STA 1895

REFERENCE TELESCOPE ORIGIN

VIEW LOOKING FORWARD

DIMENSIONS IN INCHES

WL 231

BL 0

WL 118

– – – – AIRCRAFT ENVELOPE

FIGURE 2
AFT CAVITY ENVELOPE

D. MACHAK	AS DOOR ELEVATION RANGE:	ENTIRE 360 deg
	TELESCOPE ELEVATION RANGE:	NA
5/7/92	MAX. OUT OF PLANE ANGLE:	NA

SCALE: .025"=1"

0   40   80

FIGURE 3
AFT CAVITY ENVELOPE

D. MACHAK	AS DOOR ELEVATION RANGE:	ENTIRE 360 deg	NOT TO SCALE
5/7/92	TELESCOPE ELEVATION RANGE:	NA	
	MAX. OUT OF PLANE ANGLE:	NA	

STA 1820
STA 1885
STA 1850
STA 1850
STA 1840
STA 1820

Z
Y
X

STA 1884

STA 1880

STA 1870

STA 1860

STA 1850

STA 1840

STA 1740 -1820

STA 1895

LOS AXIS

ELEVATION

30

30

VIEW LOOKING FORWARD

DIMENSIONS IN INCHES

FOR A SPECIFIC DOOR POSITION, CONTOURS BETWEEN THE HEAVY LINES ARE ACTIVE.

EXCEPT FOR THE OUTERMOST CONTOUR, CONTOURS OUTSIDE THE HEAVY LINES ARE NOT ACTIVE FOR A FIXED DOOR POSITION.
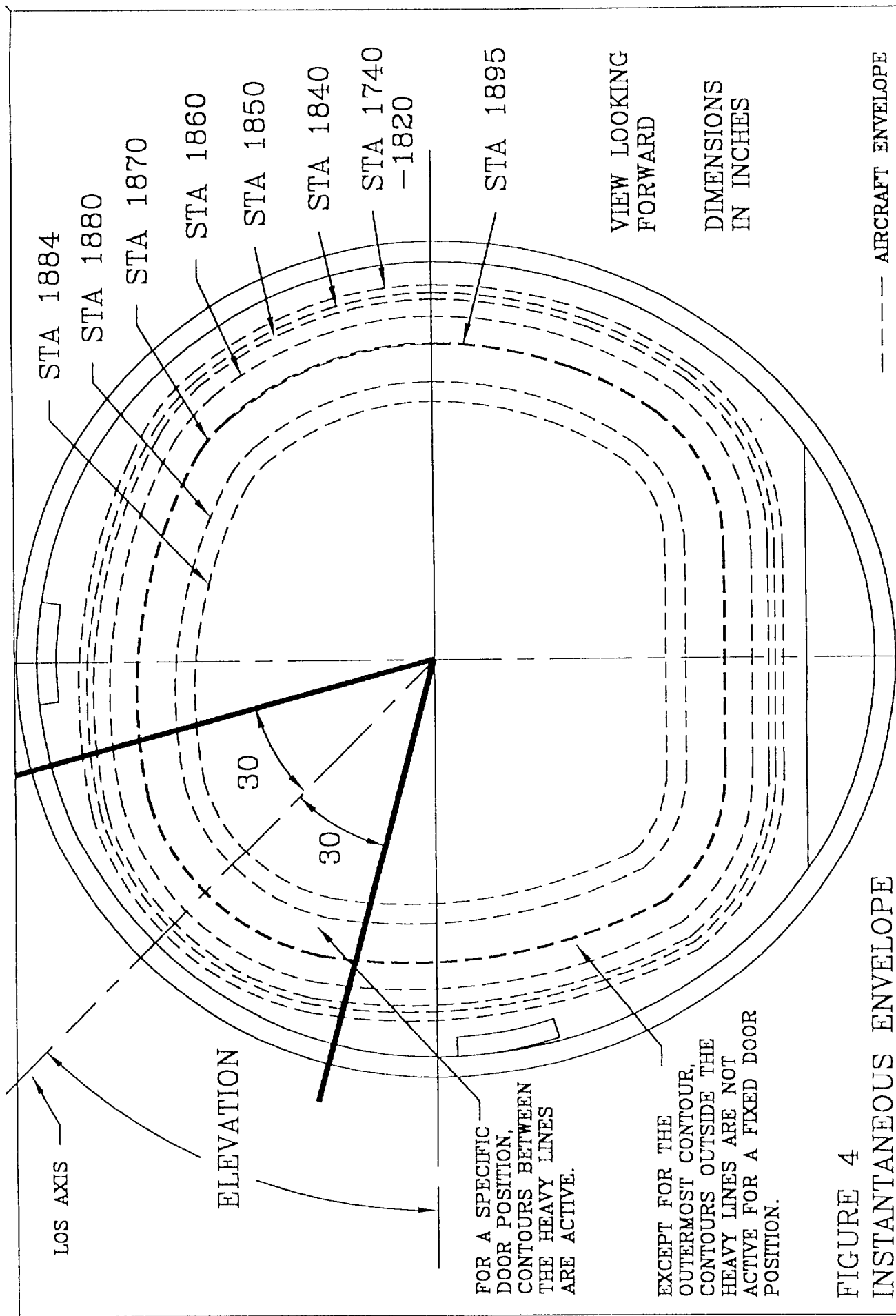
FIGURE 4
INSTANTANEOUS ENVELOPE

- - - - - AIRCRAFT ENVELOPE

SCALE: .025" = 1"

0   40   80

D. MACHAK	AS DOOR ELEVATION RANGE:	NA
	TELESCOPE ELEVATION RANGE:	NA
5/7/92	MAX. OUT OF PLANE ANGLE:	NA
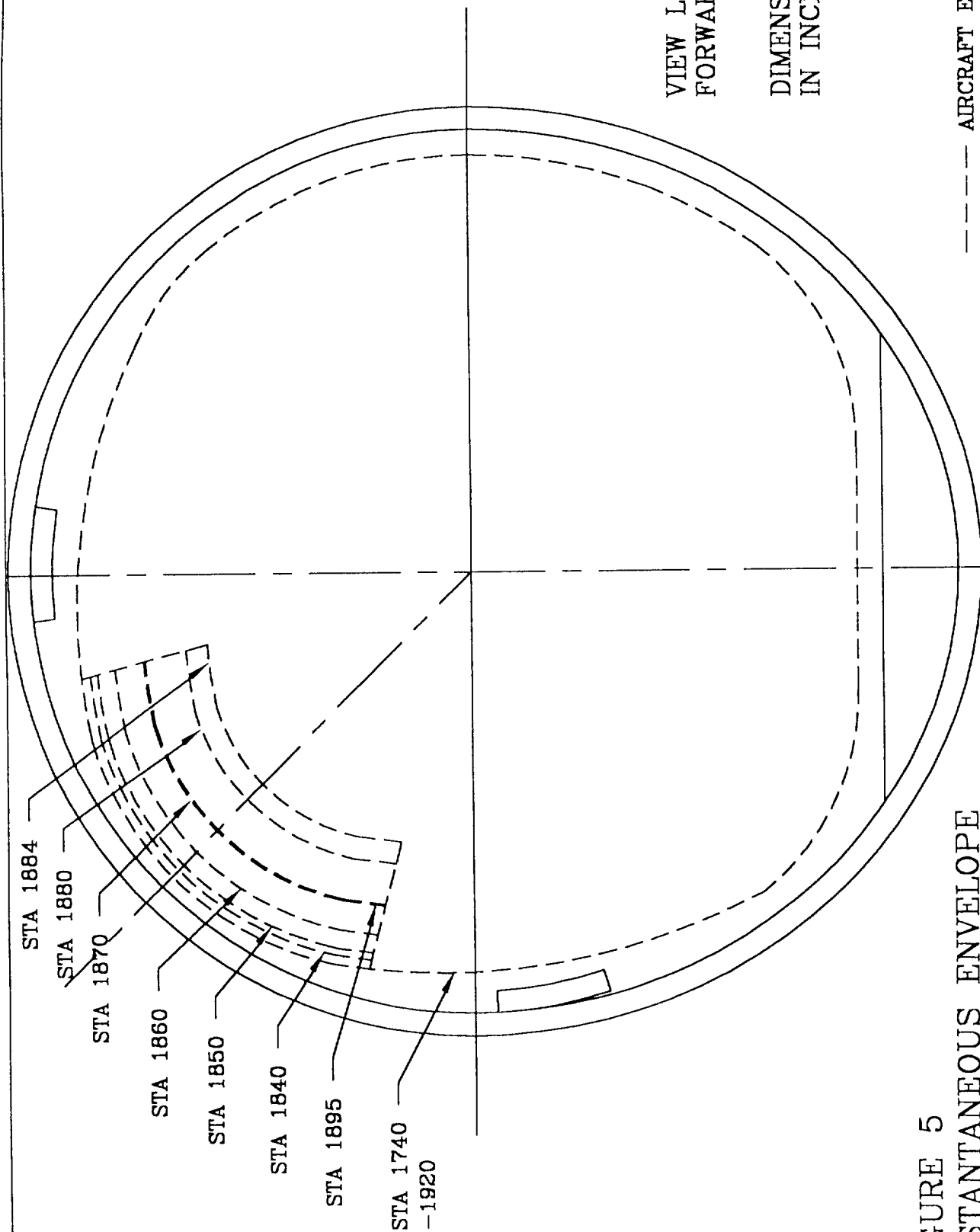
FIGURE 5
INSTANTANEOUS ENVELOPE

VIEW LOOKING
FORWARD

DIMENSIONS
IN INCHES

STA 1884

STA 1880

STA 1870

STA 1860

STA 1850

STA 1840

STA 1895

STA 1740
-1920

– – – – AIRCRAFT ENVELOPE

SCALE: .025"=1"

0   40   80

D. MACHAK	AS DOOR ELEVATION RANGE:	45 deg
	TELESCOPE ELEVATION RANGE:	NA
5/7/92	MAX. OUT OF PLANE ANGLE:	NA

OUTER FUSELAGE

VIEW LOOKING
FORWARD

DIMENSIONS
IN INCHES

STA 1480/1640
TO STA 1720

STA 1720
TO STA 1740
(BULKHEAD)

REFERENCE
TELESCOPE
ORIGIN

WL 231

BL 0

WL 118

— — — — AIRCRAFT ENVELOPE
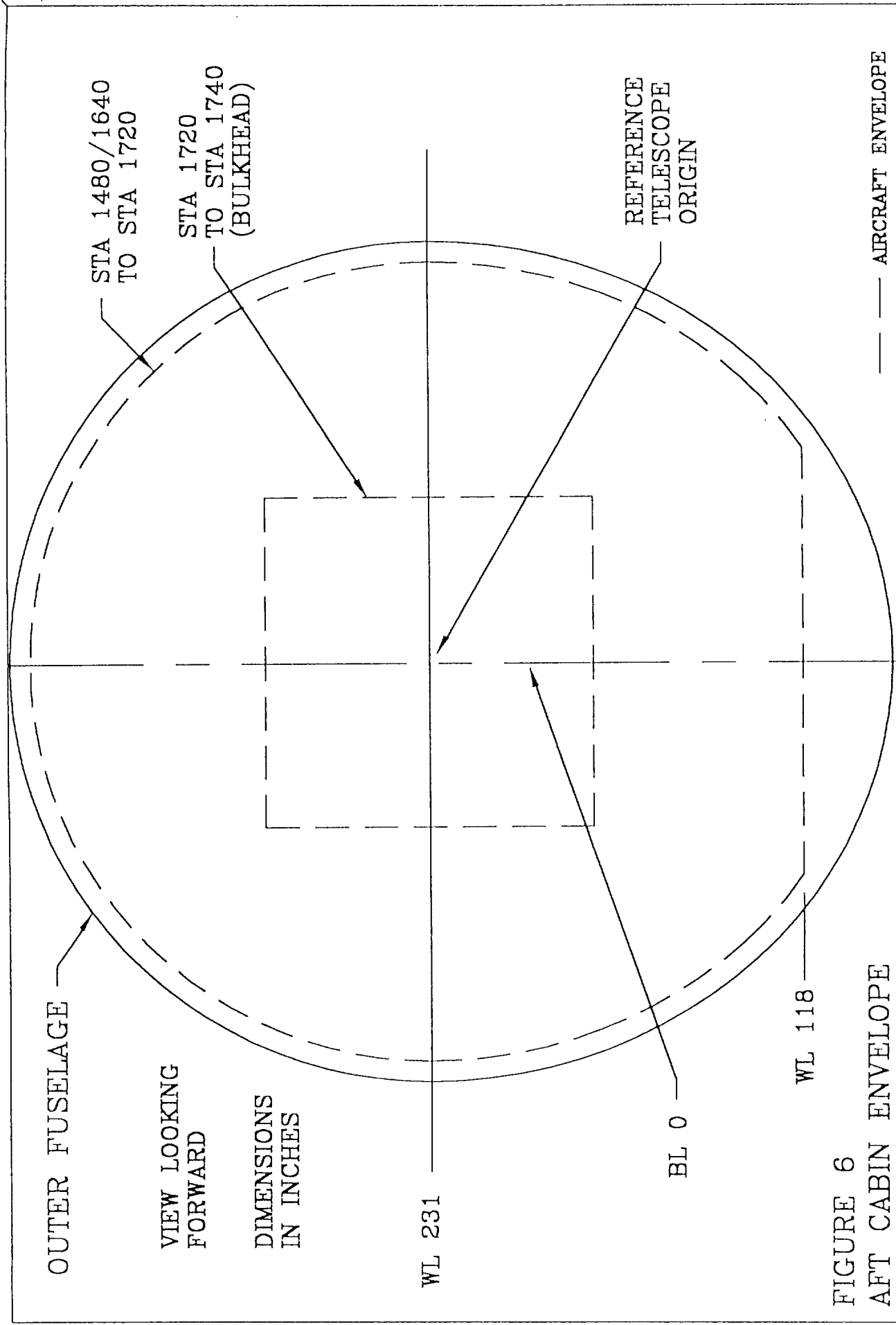
FIGURE 6
AFT CABIN ENVELOPE

D. MACHAK	AS DOOR ELEVATION RANGE:	NA
	TELESCOPE ELEVATION RANGE:	NA
5/7/92	MAX. OUT OF PLANE ANGLE:	NA

SCALE: .025"=1"

0   40   80

OUTER FUSELAGE

VIEW LOOKING
FORWARD

DIMENSIONS
IN INCHES

STA 1350 TO
STA 1480/1640

REFERENCE
TELESCOPE
ORIGIN

AIRCRAFT ENVELOPE

WL 231

WL 200

BL 0
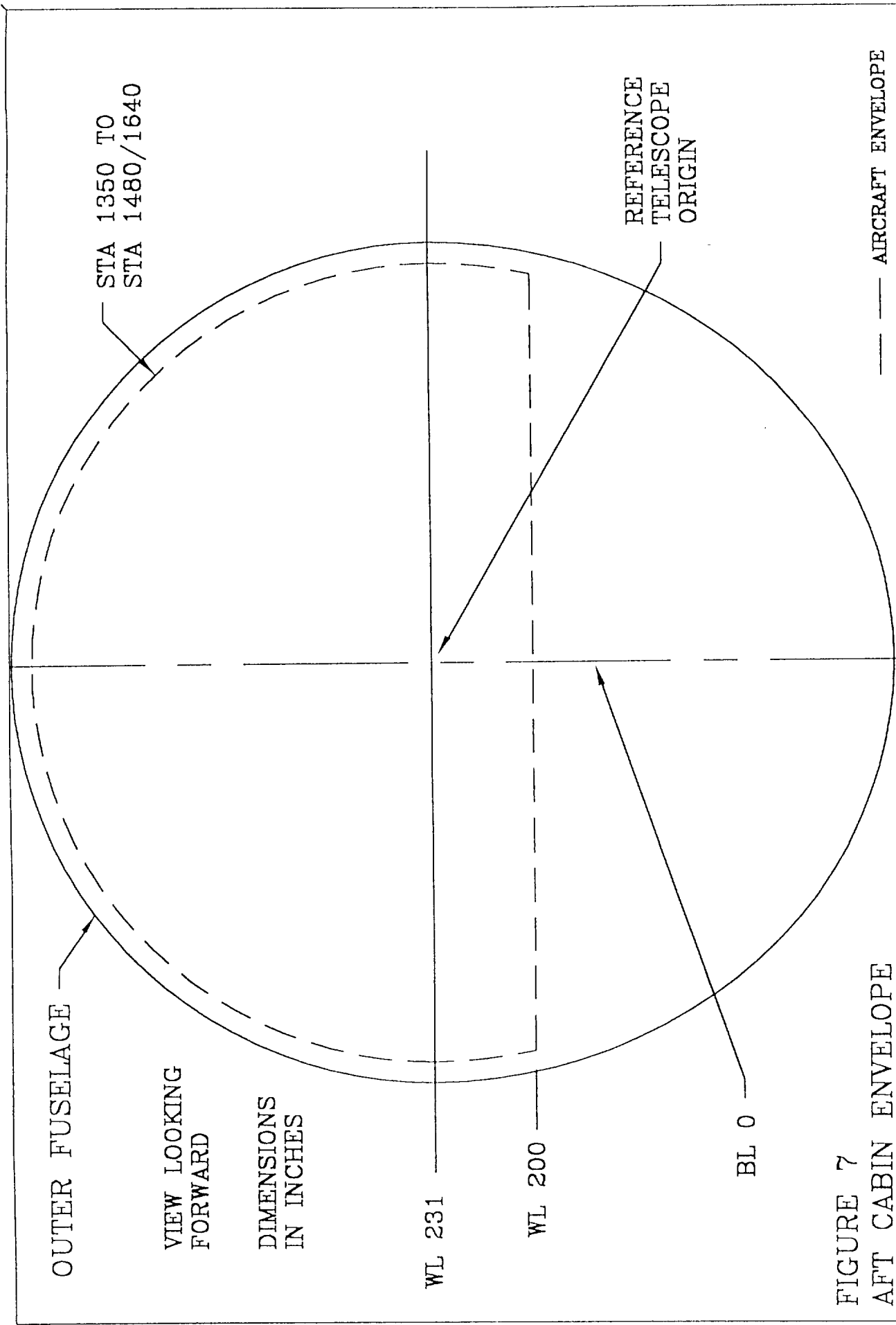
FIGURE 7
AFT CABIN ENVELOPE

D. MACHAK	AS DOOR ELEVATION RANGE:	NA
	TELESCOPE ELEVATION RANGE:	NA
5/7/92	MAX. OUT OF PLANE ANGLE:	NA

SCALE: .025"=1"

0   40   80

REFERENCE
TA ORIGIN

NOT TO SCALE

STA 1720

STA 1480/1640

STA 1350
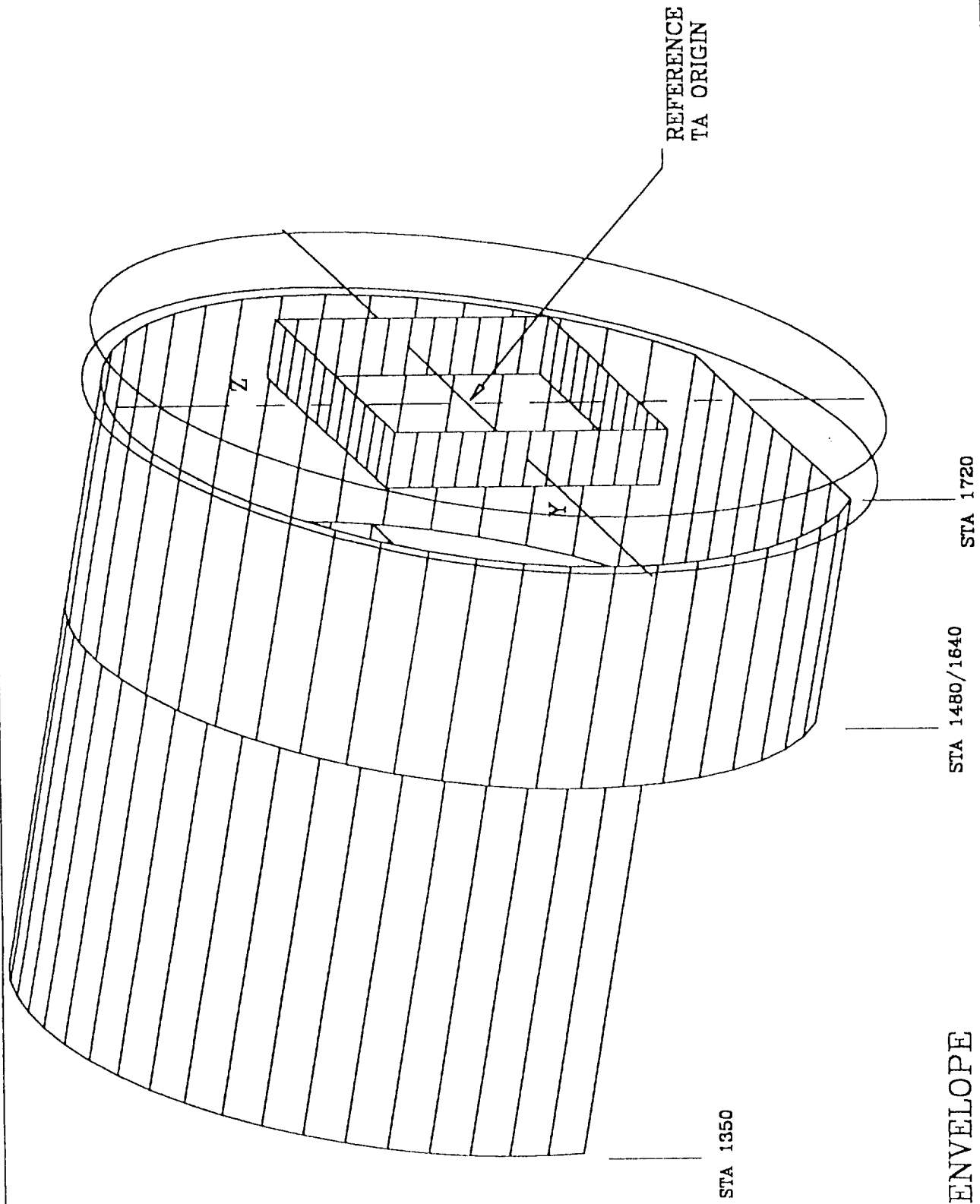
FIGURE 8
AFT CABIN ENVELOPE

D. MACHAK	AS DOOR ELEVATION RANGE:	NA
5/7/92	TELESCOPE ELEVATION RANGE:	NA
	MAX. OUT OF PLANE ANGLE:	NA

REFERENCE
TELESCOPE
ORIGIN

STA 1860

STA 1820

STA 1780

DIMENSIONS
IN INCHES

WL 231

BL 0

WL 118

----- SHEAR LAYER ENVELOPE
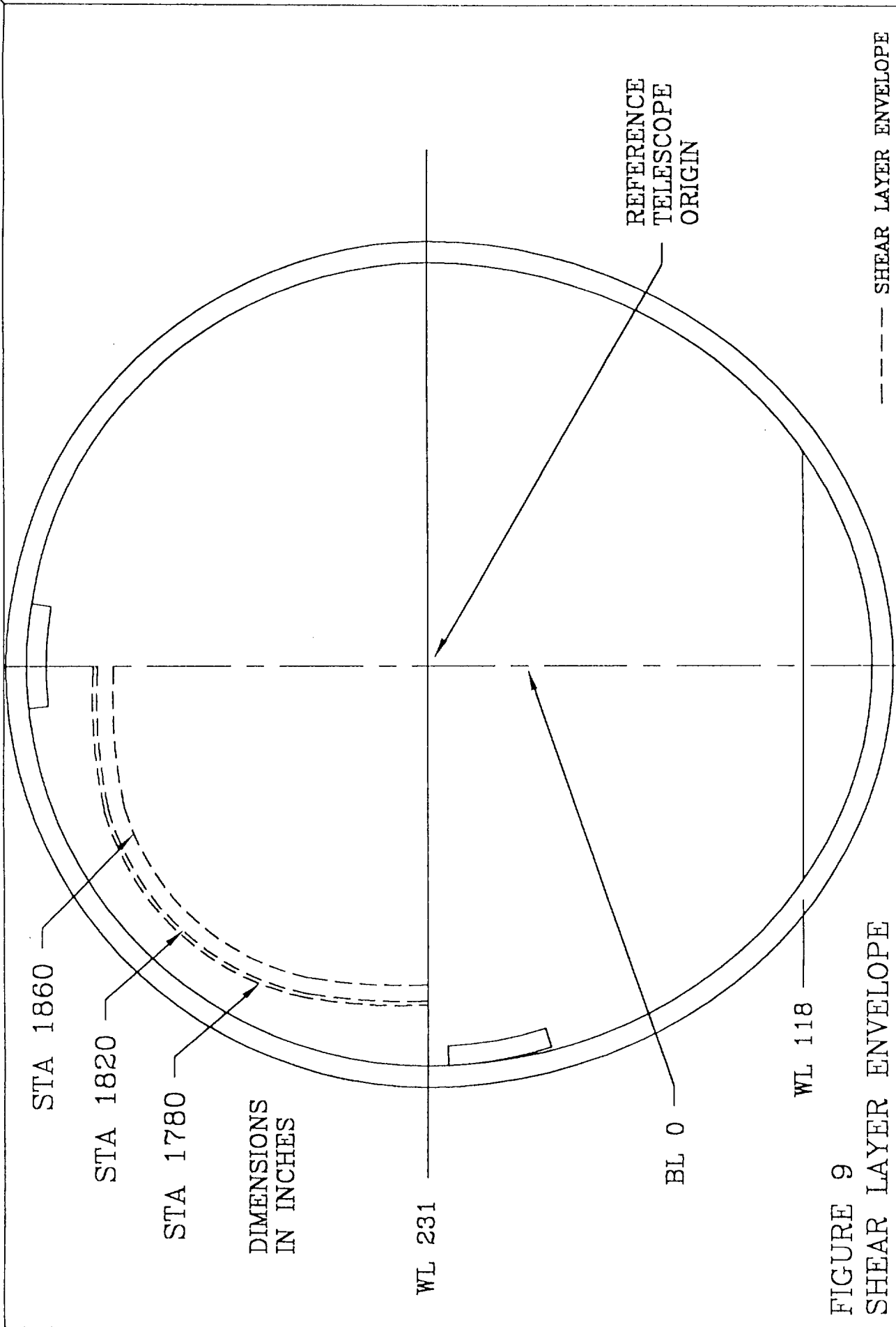
FIGURE 9
SHEAR LAYER ENVELOPE

D. MACHAK	AS DOOR ELEVATION RANGE:	NA
	TELESCOPE ELEVATION RANGE:	NA
5/7/92	MAX. OUT OF PLANE ANGLE:	NA

SCALE: .025"=1"

0   40   80